

Radiation Therapy in Breast Cancer

A Preliminary Report on the Application of a Technique of the McWhirter Type

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SUMMARY

A modification of the radiation technique advocated by McWhirter was used in the treatment of 12 patients with carcinoma of the breast. On the basis of observations it is believed that the method has definite merit. It is believed that for patients who have had radical mastectomy, radiotherapy should be protracted over a period of more than three weeks.

IN 1935 the surgical staff at the Royal Infirmary in Edinburgh began a careful evaluation of the methods of treatment of carcinoma of the breast, and in 1941 agreed upon a course of action that has since been employed.¹ Because the name of Professor Robert McWhirter has been prominent in world literature concerning the treatment of carcinoma of the breast, the method employed at the Royal Infirmary is commonly known as the McWhirter technique.

The decision to employ simple mastectomy and radiotherapy was based upon observations concerning the effectiveness of many different methods of treatment, and the following were important in influencing the staff of the Royal Infirmary to effect the change:

"1. When the disease is confined to the breast, surgery gives good results. Surgery is thus an effective method of treating the disease in the breast, and it was decided that surgical removal should be continued.

"2. While at first sight surgery might appear to be the most satisfactory method of treating the axilla, a more careful examination will show that its value is, in fact, very limited. It is true that the results are excellent when the axillary glands are not involved, but if there are no malignant cells in the axilla, it would appear unnecessary to dissect it, for the removal of normal lymph nodes cannot influence the results. On the other hand, when the axilla is secondarily involved, there is universal agreement that radical mastectomy often fails to save the life of the patient. Since, therefore, surgical removal of the lymph nodes is unnecessary when the axilla is

not involved and often fails when the axilla is involved, it was decided to treat the axilla by radiotherapy to see if better results could be obtained.

"3. In many forms of cancer radiotherapy has now become the treatment of choice, and in breast carcinoma it has been shown that postoperative recurrences can be effectively treated by this means. Immediate postoperative radiotherapy will greatly reduce the number of local recurrences. From these observations it must be concluded that radiotherapy can destroy breast cancer cells and that radiotherapy is at least an alternative method of treating the axilla."²

The technique of treatment as described by McWhirter¹ for operable cases, that is, clinical Stages I and II, is briefly as follows:

1. Simple mastectomy and removal of readily accessible lymph nodes lying outside the axillary fascia, followed by:

2. One full course of roentgen therapy begun as soon as possible after wound healing, preferably within two weeks.

3. Radiation to four fields daily. The axilla is treated through an anterior and a posterior opposed field. The chest wall is treated through two opposed tangential fields (Figure 1).

4. A minimum tumor dose of 3,750 r is given in a period of three weeks.

5. Use of roentgen ray equipment capable of producing x-rays of the quality of 3.7 mm. Cu HVL.

The results of treatment of breast cancer by that method at the Royal Infirmary since 1941 indicate survival of 43.7 per cent of *all* patients with carcinoma of the breast referred for treatment.

Since January 1, 1950, the method advocated by McWhirter has been employed (with some modification) in the treatment of 12 patients with carcinoma of the breast at Letterman Army Hospital in San Francisco. The youngest patient in this group was 30 years of age and the oldest was 66 years. The average age was 49. They were grouped, in accord with Portmann's classification of clinical staging, as follows: Stage I, four cases; Stage II, four cases; Stage III, two cases; Stage IV, two cases. Simple mastectomy was carried out in six cases (three Stage I, one Stage II, one Stage III, one Stage IV). Radical mastectomy was done in four cases (one Stage I, three Stage II). Biopsy was done in two cases classified as inoperable (one Stage III, one Stage IV). Both of the patients with Stage IV

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carcinoma died, one from extensive visceral and skeletal metastases and the other from pulmonary metastases complicated by bronchopneumonia and suppurative bronchiectasis.

The purpose of this presentation is to enumerate the technical difficulties experienced in administering the treatment; stress the complications which may arise when the technique is applied to patients who have had radical mastectomy; point out that the skin reaction is rather severe in most cases, particularly the axilla; and point out that the tumor dose recommended by McWhirter can be given with a beam of less than 3.7 mm. Cu HVL.

Technical Problems: When treatment is begun soon after radical mastectomy, patients are loath to move and it is difficult to place them in proper position for treatment of all areas. This applies particularly to the treatment of the anterolateral tangential portal which requires abduction of the arm. The time required to treat such patients may be as much as one hour and fifteen minutes daily.

Complications: Moderate to severe edema of the arm developed in four patients who had radical mastectomy in from four to eight weeks after completion of radiation therapy. This subsided after about six weeks in three instances, and persists in

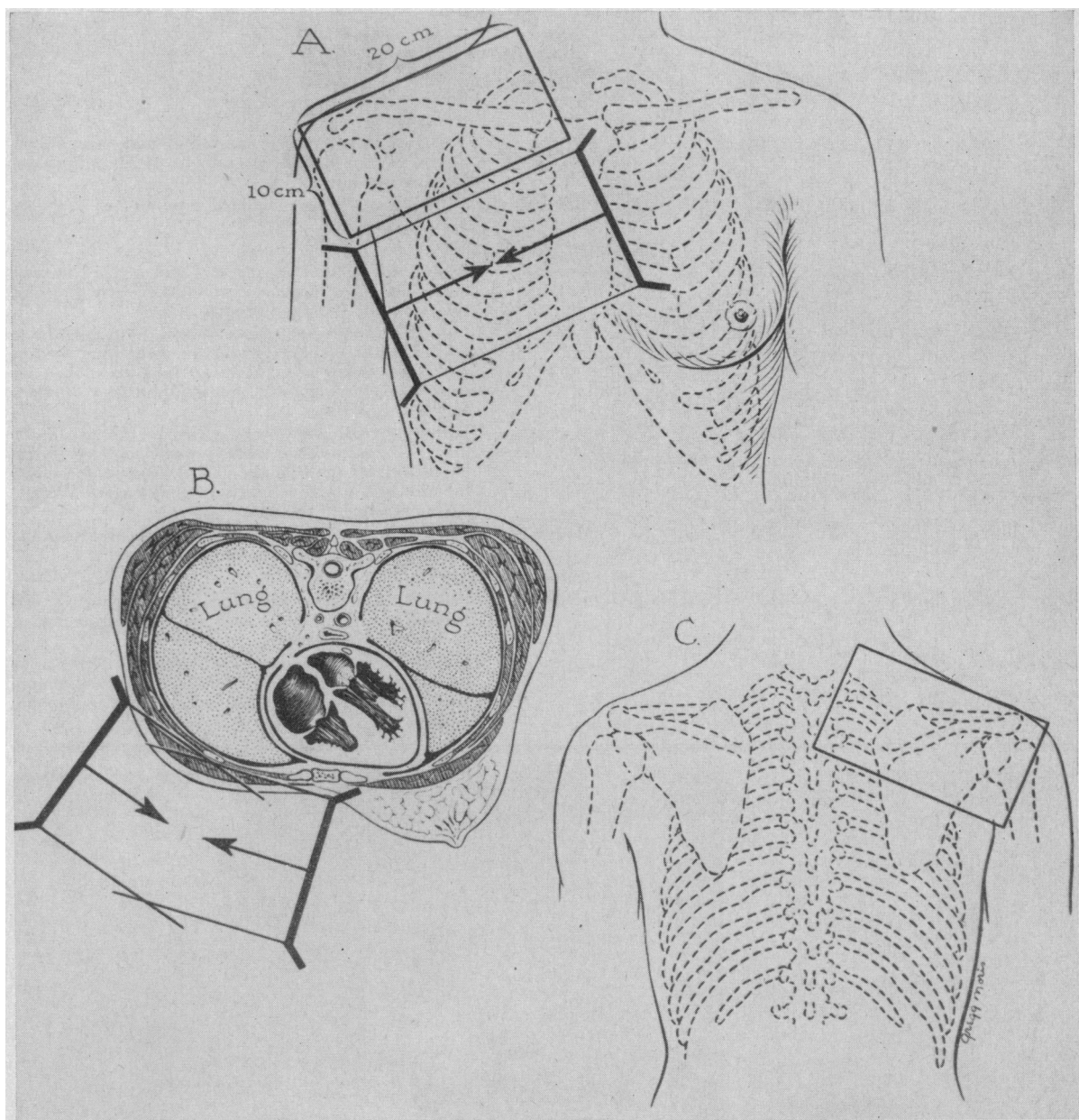


Figure 1.—Diagram of treatment portals used. Bolus bags containing rice were used on the tangential fields to the chest wall.

slight degree after 20 weeks in one. It is quite possible that similar edema would have developed in these cases after operation alone. In one case a draining sinus persisted three months after completion of treatment. This may have been due to necrosis of the remnant of the pectoralis major muscle at its insertion on the humerus following division and ligation (see Table 1).

Skin Reactions: In most cases a rather pronounced moist epidermitis developed and reached its height in ten days to three weeks after completion of radiation therapy. In all cases this was most severe in the axilla. The skin reaction on the chest wall was more severe in patients who had had radical mastectomy than in those who had had simple mastectomy (Figures 2 and 3). McWhirter does not

TABLE 1.—*The Therapy and Immediate Results of Therapy*

Case	Radiotherapy Instituted (postoperative days)	Tumor Dose Axilla	Days	Tumor Dose Chest Wall	Days	Height of Reaction (weeks)	Severity	Comments
SIMPLE MASTECTOMY								
1	11th	3,848 r	15	2,640 r	15	3-4	Moderate	None
2	15th	3,724 r	14	3,452 r	14	4	Mild to moderate	None
3	8th	3,892 r	16	2,448 r	14	3	Moderate	None
4	10th	3,810 r	17	2,652 r	15	3	Severe	Patient was somewhat obese and had severe skin reaction.
5	8th	2,600 r	12	2,040 r	12	....	.....	Treatment discontinued because of poor general condition. Patient died of visceral and skeletal metastases three weeks later.
12	5th	3,888 r	21	3,456 r	21	2	Moderate	Patient received a calculated dose to the uterus of 1,736 r in 16 days.
RADICAL MASTECTOMY								
6	15th	3,840 r	15	2,448 r	15	3	Severe	Pitting edema of arm, forearm and hand developed one month after therapy concluded. Edema subsided somewhat but persisted in arm.
7	15th	4,020 r	18	2,856 r	17	2-3	Very severe	Patient had minimal edema of arm. Skin anterior to apex of axilla ulcerated about six weeks after therapy and drained serous material for one week, then became secondarily infected and had purulent drainage for several weeks.
8	11th	3,952 r	15	2,784 r	14	2-3	Moderate	Following treatment severe edema of the arm developed. Five weeks after therapy was completed thrombophlebitis of the cephalic vein developed, secondary to unrelated acute cellulitis of one finger. Minimal edema remains in the arm.
9	11th	3,796 r	15	2,448 r	15	2-3	Moderate	One small area of incision had not healed two and one-half months after therapy completed.
BIOPSY ONLY								
10	.....	3,780 r	14	4,480 r	52	2	Severe	Ulcer did not granulate in. Simple mastectomy performed with skin graft. Following this multiple metastases to lung appeared.
11	.....	3,808 r	17	2,856 r	17	2	Severe	Patient died four and one-half months after completion of therapy from pulmonary metastases complicated by bronchopneumonia and suppurative bronchiectasis.

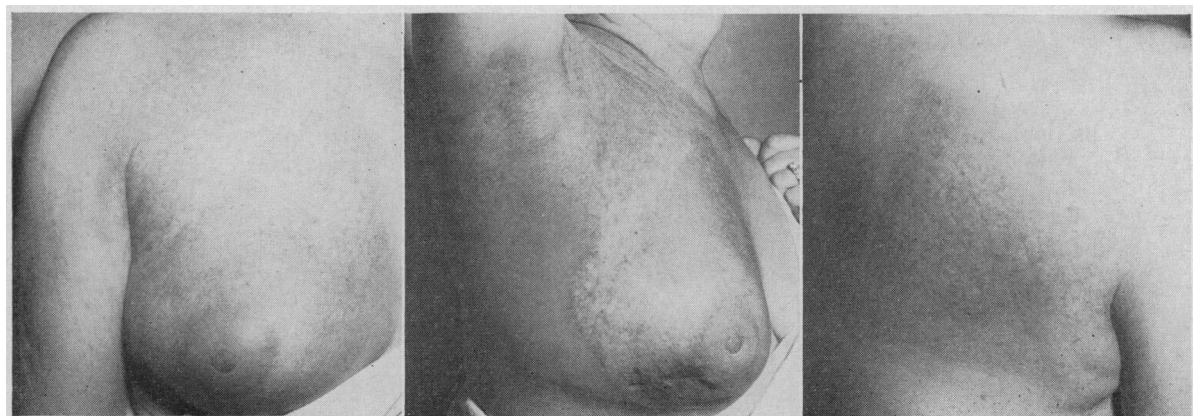


Figure 2.—Changes in the skin 14 days after completion of treatment.



Figure 3.—Changes in the skin 13 weeks after completion of treatment.

recommend heavy radiation after radical operation. No general reactions were noted.

Technical Factors: All treatment was given with a "Maximar 220" therapy machine. The factors were 220 KVP, 15 M.A., $\frac{1}{2}$ mm. Cu and 1 mm. Al added filtration, 50 cm. distance, HVL 1.4 mm. Cu.

Conclusions: From this preliminary study of 12 cases, it is felt that the method of radiation therapy of breast cancer employed at the Royal Infirmary in Edinburgh has definite merit. It is felt that if radical mastectomy is done the radiotherapy should be modified by protraction beyond three weeks in order to avoid severe reactions in tissues already devitalized by the surgical treatment.

REFERENCES

1. McWhirter, R.: The value of simple mastectomy and radiotherapy in the treatment of cancer of the breast, *British J. of Radiology*, 21:599-610, Dec. 1948.
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Discussion by L. HENRY GARLAND, M.D., San Francisco

The problem of breast cancer is the problem of cancer *outside* the breast. When breast cancer is confined to the breast, simple mastectomy will cure—although radical operation is commonly done. Competent surgeons report about 75 per cent relative five-year arrests in clinical Stage I breast cancer. The reason for the 25 per cent failures is presumably that the clinical diagnosis of cancer confined to the breast was erroneous in at least that percentage of cases, and that a majority of women with cancer spread beyond the breast are not cured. When cancer has so spread, the best surgical results (by radical operation) range from 20 per cent to 40 per cent relative five-year arrests; in other words, there are 60 per cent to 80 per cent failures.

The care of women with breast cancer involves the treatment of patients in *all* stages, operable and inoperable. Haag-

ensen reported *absolute* five-year arrests in about 33 per cent of cases, Taylor 32 per cent and other workers about 30 per cent. In most of these cases the lesions were "operable," that is, were early or moderately advanced cancers; and in most of them radical operation was done.

On the other hand, McWhirter reported 35 per cent *absolute* five-year arrest in unselected material by a combination of simple mastectomy and postoperative irradiation. In his hands the over-all results, with the combination of simple operation plus postoperative irradiation, were as good as, if not better than, those achieved by others with radical operation with or without radiotherapy. They were distinctly better than were his own results with radical operation. These were reported in 1948 as follows: with radical operation and postoperative roentgen therapy (790 cases) 32.4 per cent five-year survival; with simple operation and postoperative roentgen therapy (459 cases) 42.9 per cent five-year survival. This represents an improvement in *relative* results of almost one-third.

Colonel Lodmell has started an investigation which, we hope, will be one of many such studies carried out in order to confirm or refute the results of the Scottish investigator. The colonel has emphasized that the technique he uses is a modification of McWhirter's, but I am sure that it does involve the basic principles set forth by that worker.

It was my privilege to visit McWhirter's department in June 1950. All patients with breast cancer, except the extremely obese and those in a terminal stage, were treated by simple mastectomy and postoperative irradiation. Radiation treatment usually started on the 12th postoperative day; 15 treatment days were planned, with four fields to be treated each day. The fields were marked with ink on the patient's skin and the marks renewed semi-weekly. Suitable cones were aimed at each of the fields, and the space between the cones and the patient filled with bolus bags.

The anterior thoracic wall was treated by tangential fields, each approximately 15x10 cm.; the mesial field was angled about 56 degrees and the lateral 236 degrees. A lead strip, about 8x2 cm., was laid along the upper edge of each of these tangential fields to prevent overlap with supraclavicular fields. The supraclavicular fields included the axilla, and

were irradiated anteriorly and posteriorly, with the patient's arm abducted. The anterior field averaged 25x12.5 cm., and the posterior about 20x12 cm.

The daily dose to each of the tangential fields was 275 r skin, and to the supraclavicular fields 260 r skin. Most of the units were operated at 250 kv.; the filter for the tangential fields was 0.4 mm. tin and for the supraclavicular fields 1.5 mm. tin. Attempt was made to deliver a minimum tumor dose of 3,750 r in three weeks (15 treatment days), the maximum tissue dose being about 4,500 r. The treatment was meticulously given to each patient, and a *complete follow-up* maintained. McWhirter now treats about 300 new patients each year.

The following summarizes the apparent advantages of simple mastectomy plus full postoperative irradiation over radical mastectomy:

1. Decreased chance of cancer dissemination by avoidance of the prolonged handling of tissues necessary in axillary dissection.
2. Decreased operative morbidity—a surgical procedure of less than one hour, as opposed to the five-hour procedure of Haagensen.
3. Almost complete absence of postoperative edema (as

opposed to about 10 per cent incidence after radical operation).

4. Ability of patient to resume occupation or useful work earlier than after the radical procedure.

5. Radiation procedure simpler and less time-consuming than the Swedish preoperative and postoperative technique (the only other radiotherapy technique with results statistically comparable to McWhirter's).

6. Improvement in the five-year absolute survival rate.

It is essential that major postoperative irradiation of the McWhirter type be given with the *greatest care*, and that all investigators report their results in full so that the advantages and disadvantages of the method can be assayed after the lapse of five and ten years. The immediate care and handling of these patients has been well described by the speaker, to whom we would direct just one question: Why did he decide to keep the patient's arm adducted in some of the cases?

(Colonel Lodmell replied that it was thought that, by this departure from McWhirter's technique, a better depth dose might be delivered to the axilla. Another reason was that the position caused less discomfort to the patient so soon after operation.)

